AN IMPROVED INDEX FOR MEASURING PRECINCT-LEVEL POLITICAL IDEOLOGY IN CALIFORNIA

by
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Abstract

Despite California's reputation as a solidly liberal state, there exist deep regional and neighborhood-level divisions in political ideology among voters. Factor analysis has been used in previous research to formulate an index of precinct-level ideology scores in California, based on the results of multiple ballot initiatives. However, the previous research (a) was conducted five years ago and measured a political landscape that has since changed considerably, and (b) used just two factors to form the precinct scores. The research here uses three factors to develop an improved index based on 2016 ballot initiative results. We find that California has grown more liberal overall and more polarized regionally. We also find that the new ideology index is highly predictive of 2016 presidential vote, and that Hillary Clinton's support relative to Donald Trump's slightly exceeded the expectations set forth by corresponding precinct ideology scores, meaning Clinton was more popular relative to Trump than the voters' ideology would otherwise indicate. The new ideology index illuminates the underlying beliefs and values of the California electorate at a granular level, helps us understand how those beliefs relate to presidential preferences, and has the potential to help campaigns focus their outreach on receptive or persuadable precincts.

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Acknowledgements

This capstone project represents the culmination of my most passionate interests: politics, geography, and data. I am grateful for the opportunity to work on it. I would first like to thank my advisor Dr. Jennifer Bachner, for her thorough guidance and advice throughout the research process. I also would like to thank my family and friends for their endless support. To my wife Taylor – thank you for the constant encouragement, source of laughter, and editing prowess.

1. Introduction

The 2016 United States presidential election revealed shifts in party preference across the country. The most well-known and consequential shifts occurred in Michigan, Wisconsin, and Pennsylvania – states that broke for the Republican candidate for the first time in over 25 years. Other states voted as expected but still experienced substantial shifts in party preference – Democratic-leaning states such as Rhode Island and Maine shifted toward the Republican candidate from 2012 to 2016, while Republican-leaning states like Texas and Arizona saw swings toward the Democratic candidate. These in-state shifts did not result in changes to the outcome, but they still underscore important party preference changes and serve as prominent examples of how state electorates are ideologically varied.

The simplest and most accessible indicator of perceived political ideology of a geographical area is electoral support of a presidential candidate from the most recent presidential election. In the U.S., we often label states (or other political subdivisions such as congressional districts or counties) as "Democratic" or "Republican" (or usually, more simply, "blue" or "red") depending on if that area voted for the latest Democratic or Republican presidential or congressional candidate.

However, there are two issues with this approach. First, labeling political subdivisions "blue" or "red" oversimplifies the ideological nuance of the electorate in these areas. For example, Arizona is known as a conservative red state – every major state elected official and both U.S. senators are Republican, the state legislature is controlled by Republicans, and Republican presidential candidates have won the state in every election but one since 1952. However,

Hillary Clinton only lost Arizona by 3.5 percentage points, gaining 45 percent of the vote and showing that there is a substantial amount of liberal residents in what is known as a conservative state. Most states are not monoliths. Where do these differing voters live and what characteristics do they have? A more detailed measurement of ideology can provide a nuanced understanding of the ideological variations within a geographical subdivision.

Second, it can be a misrepresentation to assume voters' political ideology based on presidential election results. There are three concepts at play: (1) political ideology (simplified as a scale from liberal to conservative, with moderate in between), (2) political party alignment, and (3) candidate voting preference. Of course, there is usually a very strong correlation between all three of these concepts – an individual who supports liberal policies will often self-identify as a Democrat and vote for Democratic candidates, just as an individual who supports conservative policies will often identify as a Republican and vote for Republican candidates. This is not true in all cases however, as voters will not always vote strictly according to their ideology or party. Decisions to vote for a particular candidate can be influenced by the candidate's personality and appearance,[1] or the efficacy or messaging of their campaign,[2] resulting in a vote that does not necessarily reflect the voter's ideology.

Ballot measure election results have the potential to reveal more established ideological beliefs, since voter opinions on the issues addressed by ballot measures are not subject to candidate characteristics or qualities. However,

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[1] Thomas Lee Budesheim and Stephen J. DePaola, "Beauty or the Beast? The Effects of

[2] Henry E. Brady, Richard Johnston, and John Sides, "The Study of Political Campaigns," in *Capturing Campaign Effects*, ed. Henry E. Brady and Richard Johnston (Ann Arbor: University of Michigan Press, 2006), 18.

the U.S. does not hold nationwide ballot measure elections – states are the largest political subdivisions where ballot measure elections are conducted. Since ballot measures results are used in this research to measure ideology, this precludes the ability to develop an ideology index for the whole country using this approach. However, it allows for an index in any state that puts ballot measures before its electorate. California is an ideal state to study, since their statewide elections frequently ask voters to vote on multiple ballot measures.

In this research, results are used from seven statewide propositions to develop a granular political ideology index for the whole state of California, culminating in ideology scores for over 20,000 precincts. The methodology is based on a previous index developed by David Latterman of the University of San Francisco,[3] but uses more recent election results and makes small but consequential alterations to the factor analysis conducted to form the ideology scores.

Through this new California political ideology index, we find California has grown more liberal overall and more polarized geographically. Ideology is highly predictive of 2016 presidential vote, though support for Hillary Clinton (or opposition to Donald Trump) was slightly stronger among liberals than their ideology would otherwise indicate. As expected, ideology is also closely associated with the political parties of Congressional representatives. Ideological beliefs correlate particularly strongly with opinions on gun control and crime and punishment issues, such as the death penalty, but are less correlated with opinions on marijuana legalization. Many liberals are also found to be less

[3] David Latterman, "The California Political Precinct Index: A detailed tool to help understand California politics," *Fall Line Analytics*, 2012, http://www.flanalytics.com/research/

supportive of income tax increases on the wealthy and death penalty repeal than expected according to their ideology scores.

Measuring political ideology and its geographical variations at the precinct-level can be of use to groups or individuals that wish to identify geographical nuances and variations in ideology with precision. Election or signature-gathering campaigns can utilize the ideology index to pinpoint precincts that would be either receptive or persuadable to their message. These precincts can serve as areas of focus for canvassing, mail, GOTV, or other targeting efforts. If made accessible and user-friendly, citizens can use the ideological measurement to assess the values and beliefs of a particular neighborhood when deciding where to live or spend time. Additionally, the ideology index can be of scholarly interest in providing a measurement with which to study geographical political trends and phenomena, in order to gain an updated understanding of the political landscape in California.

2. Theoretical Framework

2.1. Political Ideology, Party Identification, and Candidate Voting Preferences

In order to measure political ideology, it is useful to understand its definition and how it relates to party identification and candidate preferences. Political ideology has been defined in previous literature as a "set of beliefs about the proper order of society and how it can be achieved."[4] Ideologies are frameworks of shared beliefs, opinions, and values among social groups or

[4] Robert S. Erikson and Kent L. Tedin, *American Public Opinion* (New York: Longman, 2003), 64.

constituencies,[5] [6] dictating how individuals or groups perceive society and how political ideals should be attained.[7] One concept closely related to political ideology is party identification, which is commonly known as "an effective attachment to an important group object in the environment,"[8] and further defined as a long-term attachment to a preferred political party.[9] That emotional attachment to a political party is based on the party's public image, [10] [11] and can be a facet of one's identity just as ethnic or religious identity.[12]

The relationship between ideology and party identification is contested among scholars. Some argue that party identification is reliant on existing ideological beliefs,[13] while others assert that ideology is dependent on party identification, especially as elite-level Democrats and Republicans have become more polarized, causing individuals to tailor their policy preferences to their partisan leanings.[14]

Regardless of whether ideology drives party identification or vice versa, it is clear that the two concepts are closely tied. If so, why not base an ideology

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[5] Michael Freeden, "Political Ideologies in Substance and Method," *Reassessing Political Ideologies–The Durability of Dissent* (2001): 1.

[6] Kathleen Knight, "Transformations of the Concept of Ideology in the Twentieth Century," *American Political Science Review* 100, no. 4 (2006): 622-23.

[7] John T. Jost, Christopher M. Federico, and Jamie L. Napier, "Political Ideology: Its Structure, Functions, and Elective Affinities," *Annual Review of Psychology* 60, (2009): 309.

[8] Angus Campbell et al., *The American Voter* (New York: Wiley, 1960).

[9] Russell J. Dalton, "Party Identification and Its Implications," *Oxford Research Encyclopedias* (2016), doi: 10.1093/acrefore/9780190228637.013.72.

[10] Paul Goren, "Party Identification and Core Political Values," *American Journal of Political Science* 49, no. 4 (2005): 882.

[11] Campbell et al., *The American Voter*.

[12] Ibid.

[13] Alan I. Abramowitz and Kyle L. Saunders, "Ideological Realignment in the US Electorate," *The Journal of Politics* 60, no. 3 (1998): 634.

[14] Thomas M. Carsey and Geoffrey C. Layman, "Party Polarization and 'Conflict Extension' in the American Electorate," *American Journal of Political Science* 46, no. 4 (2006): 786.

index on vote percentages in candidate elections where the candidates' political parties are specified, such as presidential, gubernatorial, congressional, or state legislative races? Party identification is a distinct concept from voting preferences,[15] especially when those voting preferences are also influenced by candidate qualities and characteristics.

Voters in the U.S. rely on their own party identification or political ideology as a cue for selecting political candidates for whom to vote, but candidate qualities can also have an impact. Research differs on the overall importance of presidential candidate qualities in voter decisions – some have found that presidential candidates' personal traits play a significant role in voter decisions,[16] [17] while others find that candidate personalities and images have only a minor impact on election outcomes.[18] Some traits certainly matter more than others – for example, a candidate's sex and race play a significant role in voting preferences.[19] [20] The effect of candidate traits can also be dependent on whether the candidate is an incumbent or challenger.[21]

Candidates make appeals to voters through campaigns, which can also impact voting preferences. Facets of the campaign, such as the candidate's

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[15] Dalton, "Party Identification."

[16] Gregory B. Markus, "Political Attitudes During an Election Year: A Report on the 1980 NES Panel Study," *American Political Science Review* 76, no. 3 (1982): 538.

[17] Carolyn L. Funk, "The Impact of Scandal on Candidate Evaluations: An Experimental Test of the Role of Candidate Traits," *Political Behavior* 18, no. 1 (1996): 1.

[18] Larry M. Bartels, "The Impact of Candidate Traits in American Presidential Elections," in *Leaders' Personalities and the Outcomes of Democratic Elections*, ed. Anthony King (Oxford University Press, 2002).

[19] Kira Sanbonmatsu, "Gender Stereotypes and Vote Choice," *American Journal of Political Science* (2002): 20.

[20] Josh Pasek et al., "Determinants of Turnout and Candidate Choice in the 2008 US Presidential Election: Illuminating the Impact of Racial Prejudice and other Considerations," *Public Opinion Quarterly* 73, no. 5 (2009): 943.

[21] Kim L. Fridkin and Patrick J. Kenney, "The Role of Candidate Traits in Campaigns," *The Journal of Politics* 73, no. 1 (2011): 72.

presented image or the issues they choose to prioritize in their appeals, have been found to affect vote choice.[22] These campaign effects often manifest themselves through the process of priming, framing, and agenda setting,[23] through advertising and media coverage.[24] However, though campaigns can influence voter decisions, the majority of political research over the last 50 years has found the effects to be minimal.[25] [26]

Although the exact nature of the effect of candidate qualities and campaigns on voting outcomes is debated, it is clear that an effect does exist. Using candidate election results to develop the ideology index would have led to trouble, due to the difficulty of isolating ideology's influence on voting preferences compared to the influence of candidate and campaign effects. This is especially true for the 2016 presidential election, where both Hillary Clinton and Donald Trump were the most unpopular major party candidates in recent history.[27] Though candidate preferences are closely associated with party preferences and political ideology, the concepts do not always align.[28] It would have been ill advised to base our understanding of the ideological variations of the electorate on the presidential election, where many factors play a role in vote decisions.

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[22] Dalton, "Party Identification."

[23] Diana Carole Mutz, Paul M. Sniderman, and Richard A. Brody, eds, *Political Persuasion and Attitude Change* (Ann Arbor: University of Michigan Press, 1996).

[24] Stephen Ansolobehere and Shanto Iyengar, *Going Negative: How Political Adveritsement Shrink and Polarize the Electorate* (New York: Free Press, 1995).

[25] Campbell et al., *The American Voter*.

[26] Larry M. Bartels, "Messages Received: The Political Impact of Media Exposure," *American Political Science Review* 87, no. 2 (1993): 267.

[27] Gary C. Jacobson, "The Triumph of Polarized Partisanship in 2016: Donald Trump's Improbable Victory," *Political Science Quarterly* 132, no. 1 (2017): 16.

[28] Dalton, "Party Identification."

Ballot measure election results, rather than candidate results, are more reliable indicators of voters' ideological beliefs. Ballot measure votes reflect preferences for single issues, which are steady and well-structured,[29] as opposed to candidate voting preferences that can be influenced by other factors. When a wide array of ballot measures is used to make the index, the measurement can take into account opinions on a diverse set of clearly defined issues. Using ballot measure results for the California-wide index also presents methodological advantages to candidate results. First, there are not enough highly publicized candidate races that are voted on by the whole state upon which to base an index, as opposed to ballot measures which are both abundant and consistently presented to the whole state. Second, California employs a top-two primary system, where the top-two vote-getters in candidate primary elections proceed to the general election ballot, regardless of the candidates' party affiliations. In a heavily Democratic state like California, this results in many general election races between two Democrats. It would be impossible to assess political ideology based on a race between two members of the same party. Such a pitfall can be avoided with the use of ballot measures. It should be noted however that even though ballot measure preferences are not subject to candidate effects, campaign effects still exist, especially when a large amount of money is spent to advocate for or against a certain ballot measure.[30]

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[29] Stephen Ansolabehere, Jonathan Rodden, and James M. Snyder, "The Strength of Issues: Using Multiple Measures to Gauge Preference Stability, Ideological Constraint, and Issue Voting," *American Political Science Review* 102, no. 2 (2008): 215.

[30] Thomas Stratmann, "The Effectiveness of Money in Ballot Measure Campaigns," *Southern California Law Review* 78 (2004): 123.

2.2. Historical Granular Measurements of Political Ideology

Surveys have been used to measure ideology at a congressional district level,[31] but survey sample sizes are usually too small to have enough respondents to make district-level conclusions without large measurement error.[32] Multi-level regression and post-stratification models have been used as well to create ideal point estimates for congressional districts.[33] Researchers have used vote share and election result data to measure political ideology,[34] [35] but most of it has, again, been done at the district level rather than the more detailed precinct level, with the exception of Nahm et al.[36]

The analysis contained here is specifically based on David Latterman's California Political Precinct Index,[37] which was extrapolated from Latterman and Rich DeLeon's update to their original "progressive voter index" of San Francisco precincts.[38] Latterman's index is a conservative-to-liberal scale from 0 to 100, with each precinct in California scoring somewhere on the scale. Precinct scores are formulated from an aggregation of election results for nine statewide

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[31] Wakken E. Miller, and Donald E. Stokes, "Constituency Influence in Congress," *American Political Science Review* 57, no. 1 (1963): 45-56.

[32] Robert S. Erikson, "Constituency Opinion and Congressional Behavior: A Reexamination of the Miller-Stokes Representation Data," *American Journal of Political Science* (1978): 511-535.

[33] Chris Tausanovitch and Christopher Warshaw, "Measuring Constituent Policy Preferences in Congress, State Legislatures, and Cities," *The Journal of Politics* 75, no. 2 (2013): 330.

[34] Matthew S. Levendusky, Jeremy C. Pope, and Simon D. Jackman, "Measuring District-Level Partisanship with Implications for the Analysis of US Elections," *The Journal of Politics* 70, no. 3 (2008): 736.

[35] Jonathan N. Katz and Gary King, "A Statistical Model for Multiparty Electoral Data," *American Political Science Review* 93, no. 1 (1999): 15-32.

[36] Alison Nahm, Alex Pentland, and Peter Krafft, "Inferring Population Preferences via Mixtures of Spatial Voting Models," in *International Conference on Social Informatics*, 290-311, Springer International Publishing, 2016.

[37] David Latterman, "The California Political Precinct Index."

[38] Richard DeLeon and David Latterman, "Updating the New Progressive Voting Index (PVI), with Tables, Map, and Precinct Scores,"*Fall Line Analytics*, 2004, http://www.flanalytics.com/research/

ballot measures from 2008 to 2010. The particular ballot measures were selected primarily because of their clear, defensible, liberal and conservative sides.

Latterman compiled the results from the nine ballot measures and used factor analysis with varimax rotation to obtain two independent factors that were then summed and standardized on a 0-100 scale, with 0 as the most conservative value and 100 as the most liberal. The aim of this analysis is to update the findings for improved accuracy in 2017. The analysis presented here will employ most of the same methodology as Latterman's, but using more current statewide ballot measure results to gauge precinct scores, as well as changing the method of factor analysis.

3. Data and Methods

The methodology used to develop the new ideology index largely mirrors David Latterman's methodology for constructing his 2012 California precinct index.[39] There are two primary differences in the development of this new index: (1) it is based on election results from 2016, which provides a more current assessment of ideology in California, and (2) it is built using three latent factors rather than two. An explanation for why three factors were used will be addressed in Section 3.2.

3.1. Ballot Proposition Selection

First came the selection of ballot propositions to use for the index. Propositions with clear, defendable liberal and conservative sides were selected.

[39] David Latterman, "The California Political Precinct Index.

The seven propositions selected for the index are depicted in Table 3.1. For each of them, the conventional liberal side is "yes" and conservative side is "no."

Table 3.1 – 2016 California Ballot Propositions Used for Ideology Index

Proposition	Description	Yes Vote	No Vote
51	Education bond	55.2%	44.8%
55	Income tax to support education	63.3%	36.7%
57	Relaxed sentencing for non-violent felons	64.5%	35.5%
58	Bilingual education in public schools	73.5%	26.5%
62	Death penalty repeal	46.9%	53.1%
63	Gun control/improved background checks	63.1%	36.9%
64	Legalization of recreational marijuana	57.1%	42.9%

Source: California Secretary of State

The index would have benefitted from utilizing results from multiple state elections, e.g. using ballot measure results from 2014 as well as 2016. But since precinct designations and boundaries often change, and do so at the direction of individual counties, it was not within the scope of this research to consolidate precinct results from two different elections within the time constraints given, a process that would have involved breaking the results down into census blocks and then aggregating those blocks into 2014 and 2016 precincts.

3.2. Factor Analysis and Using Three Factors

After collecting election result data from the Statewide Database from University of California, Berkeley,[40] I performed a factor analysis with three factors and varimax rotation using the "yes" vote percentages of the seven propositions in each precinct to generate precinct-level ideology scores, which produced eigenvalues explaining the variance accounted for by the three factors.

[40] "2016 General Election Precinct Data," *Statewide Database*, *University of California, Berkeley*, accessed December 5, 2017. http://statewidedatabase.org/d10/g16.html.

Based on the Kaiser rule, which dictates that factors with eigenvalues of at least one are important enough to retain, all three factors were used to determine the precinct scores.[41] Table 3.2 presents the eigenvalues and variance for each factor.

Table 3.2 – Eigenvalues and Variance of the Three Factors

	Factor 1	Factor 2	Factor 3
Eigenvalue	2.513	2.512	1.150
Proportional Variance	0.359	0.359	0.164
Cumulative Variance	0.359	0.718	0.882

A factor in this context is an underlying construct that causes the variations in proposition results from precinct to precinct. Factors 1 and 2 are equally important and both explain a greater part of the variation in the results than Factor 3 does, according to their eigenvalues. Factor loadings for each variable indicate the degree to which the results of each proposition are driven by the three underlying factors. Table 3.3 contains the factor loadings for the seven propositions.

Table 3.3 – Factor Loadings for Each Proposition

Proposition	Factor 1	Factor 2	Factor 3
51	0.87	0.24	0.29
55	0.83	0.39	0.20
57	0.48	0.75	0.36
58	0.68	0.56	0.34
62	0.36	0.75	0.44
63	0.44	0.50	0.75
64	0.25	0.79	0.18

[41] Henry F. Kaiser, "The application of electronic computers to factor analysis," *Educational and Psychological Measurement* 20, no. 1 (1960): 141-151.

How do we interpret the factors? Factors 1 and 2 have a fairly linear relationship. The loadings for both factors are tightly correlated (with a correlation coefficient of -0.88), meaning that the two factors explain similar phenomena. Propositions 51 and 55 are on one end, loading highly on Factor 1 but lowly on Factor 2, while Propositions 57, 62, and 64 have somewhat similar high loadings on Factor 2 and relatively low loadings on Factor 1. This divergence makes logical sense – Propositions 51 (bond measure) and 55 (income tax measure on those making over $250,000) are the two financial propositions in the dataset, while Propositions 57 (reforming sentencing for non-violent felons), 62 (death penalty repeal), and 64 (marijuana legalization) are more related to crime and punishment. Though liberals are generally expected to vote "yes" on all of the propositions, and conservatives expected to vote "no," some voters may be more liberal on financial issues but conservative on cultural issues, and vice versa. Variations and nuance in policy preferences result in the different loadings for each proposition.

Factor 3 is more difficult to interpret. It has a very low correlation with either of the other two factors. Proposition 63 (gun control) has an extremely high loading on Factor 3 compared to the other ballot measures, especially Proposition 64 (marijuana) and the two financial measures. It is possible that Factor 3 reflects the fact that some voters' opinions on such diverse concerns as gun control versus marijuana legalization or progressive taxes may not conform to traditional liberal/conservative expectations. For example, voters in certain precincts may have more libertarian values of less government control over both firearms and drugs, which would cause them to support the "conservative" side of gun control but the "liberal" side of marijuana legalization. Or there may be

poorer rural voters who favor Proposition 55's income tax on wealthy individuals but oppose gun control. These potential deviations from traditional ideological norms could explain the variance described by Factor 3.

Each proposition also has a communality and uniqueness value. The communality value is determined by summing the eigenvalues of all three factors, and `uniqueness = 1 – communality`. The uniqueness value for a proposition reflects the degree to which that proposition uniquely causes variance not shared with other propositions in the voting results. Most of the uniqueness values for the propositions are fairly low, between 0.005 and 0.117, with the exception of Proposition 64, the marijuana legalization measure, which has a uniqueness value of 0.279. Proposition 64 adds a more unique element to the variance in the results than the other propositions.

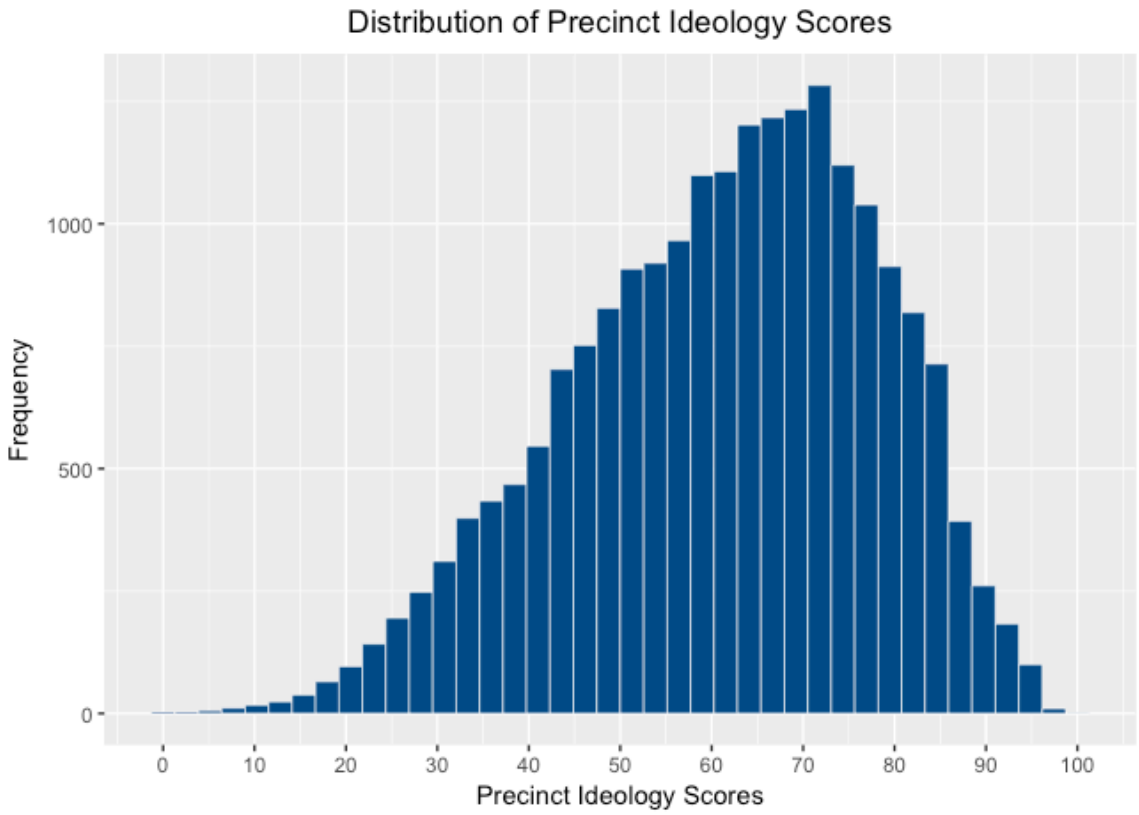
The factor analysis process provides each precinct in the dataset with values for each of the three factors based on that precinct's proposition vote percentages. These scores were then summed and scaled to a range of 0 to 100, with 0 being conservative and 100 being liberal. Only precincts with at least 20 registered voters were considered in the analysis, resulting in 20,778 precincts in total with composite political ideology scores.

4. Results

4.1. California: More Liberal Overall and More Polarized Regionally

Figure 4.1 depicts the overall distribution of precinct ideology scores. The mean precinct score is 61.2 and median precinct score is 63.1.

Figure 4.1



As expected, there is considerable geographical variation in ideology. Figure 4.2 is a boxplot displaying the distributions of precinct scores in every county in California. Bay Area counties such as San Francisco, Marin, and Alameda are very liberal, as well as Los Angeles County, while less populated counties in the northern and Central Valley regions, such as Tehama, Lassen, and Modoc, are more conservative. A consolidated look at the distribution of scores by region is depicted in Figure 4.3.

Compared to Latterman's previous index, the mean and median precinct ideology scores have increased. The mean has increased from 56.3 to 61.2, while the median has increased from 56.4 to 63.1. This could be attributed to two elements, acting in confluence with each other – (1) the state has grown more

Figure 4.2

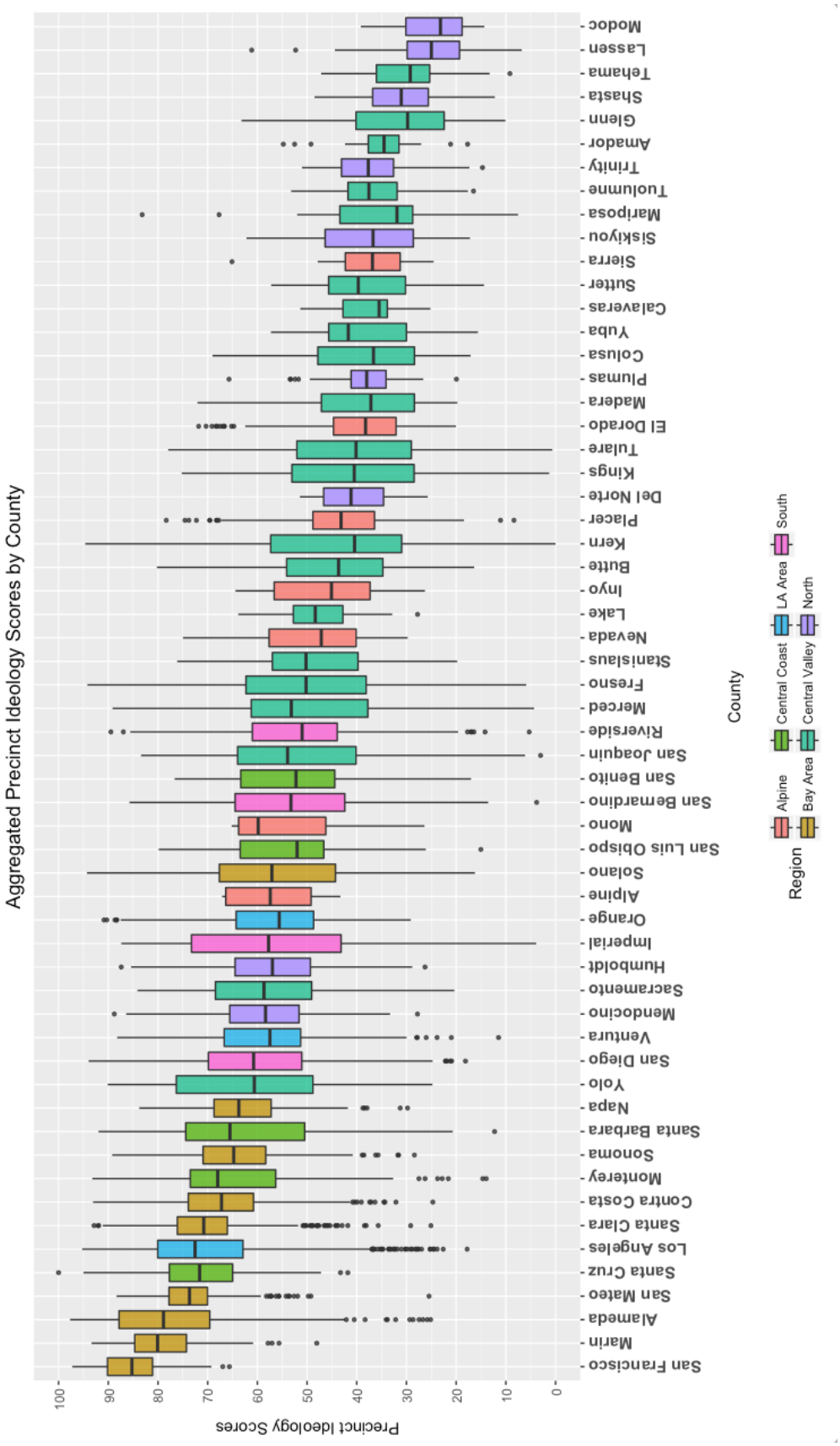
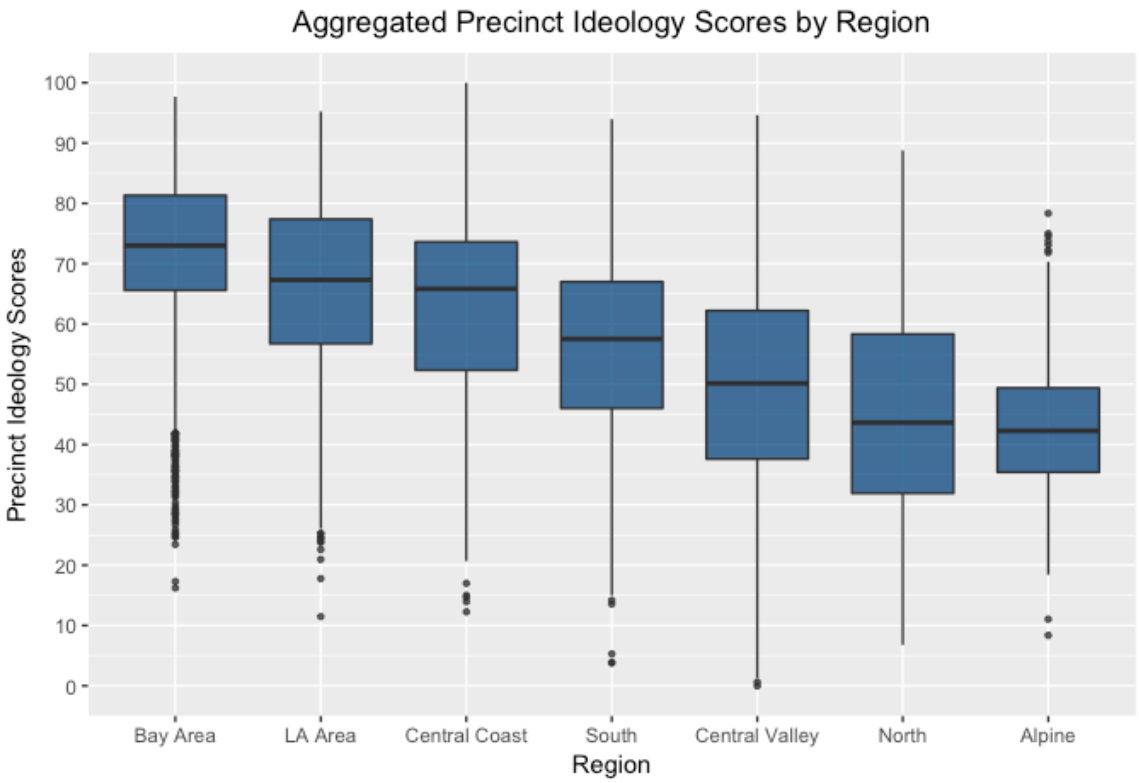

Aggregated Precinct Ideology Scores by County
Precinct Ideology Scores
100
90
80
70
60
50
40
30
20
10
0
San Francisco
Marin
Alameda
San Mateo
Santa Cruz
Los Angeles
Santa Clara
Contra Costa
Monterey
Sonoma
Santa Barbara
Napa
Yolo
San Diego
Ventura
Mendocino
Sacramento
Humboldt
Imperial
Orange
Alpine
Solano
San Luis Obispo
Mono
San Bernardino
San Benito
San Joaquin
Riverside
Merced
Fresno
Stanislaus
Nevada
Lake
Inyo
Butte
Kern
Placer
Del Norte
Kings
Tulare
El Dorado
Madera
Plumas
Colusa
Yuba
Calaveras
Sutter
Sierra
Siskiyou
Mariposa
Tuolumne
Trinity
Amador
Glenn
Shasta
Tehama
Lassen
Modoc
County
Region
Alpine
Bay Area
Central Coast
Central Valley
LA Area
North
South

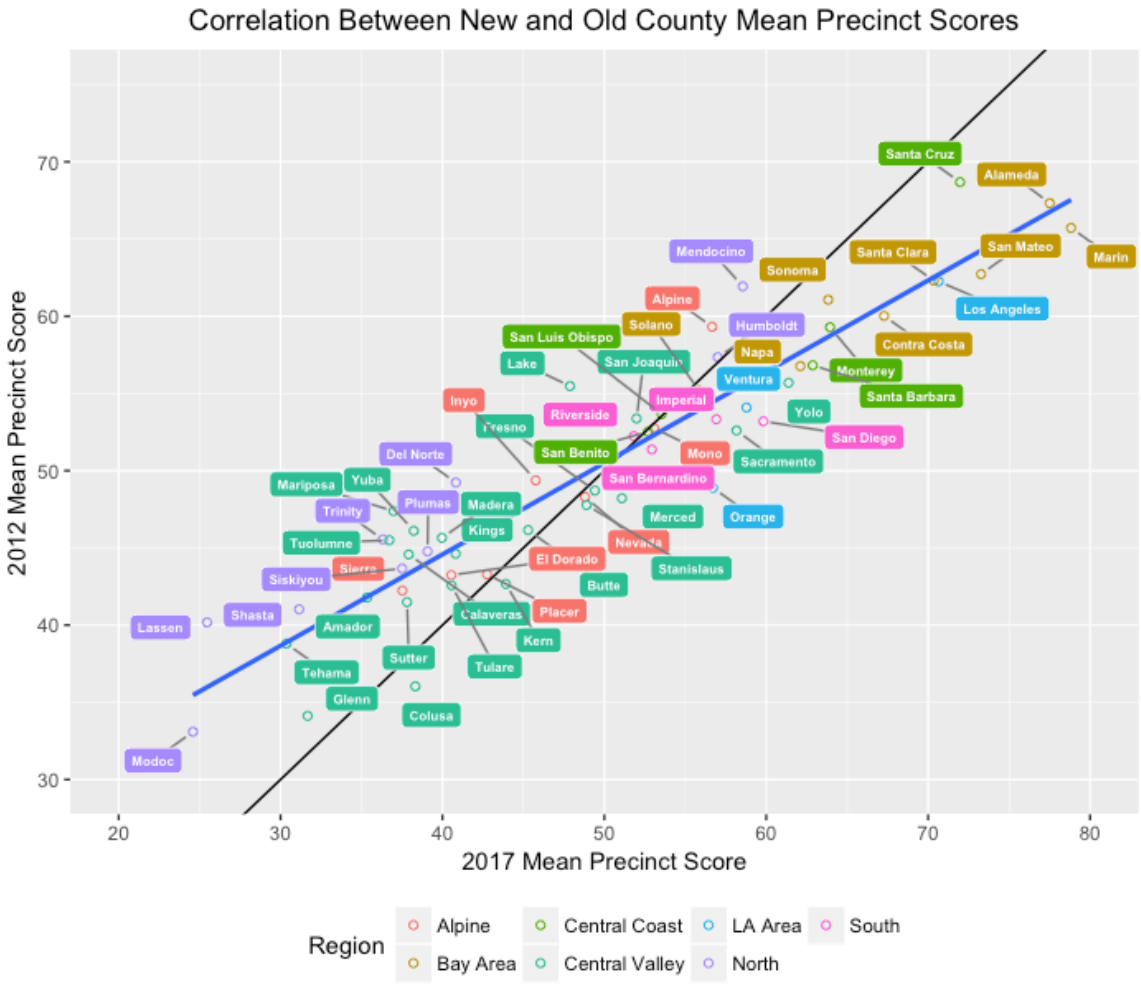
Figure 4.3



liberal as a whole, and (2) this new and altered way of measuring ideology, which includes (a) conducting three-factor analysis rather than two and (b) using data from different propositions addressing different policy issues, has had an effect on the outcome. The degree to which each of these two elements accounts for the higher mean and median precinct scores is uncertain.

Political ideology also appears to have become more regionally polarized. The standard deviation of precinct scores has increased from 11.7 to 16.7, meaning that the distribution of precinct scores throughout the whole state is wider and thus more polarized. This polarization is concentrated regionally – liberal counties have become more liberal and conservative counties have become more conservative. This phenomenon is depicted in Figure 4.4, where most counties with conservative scores (scores under 50) experienced a decrease

Figure 4.4



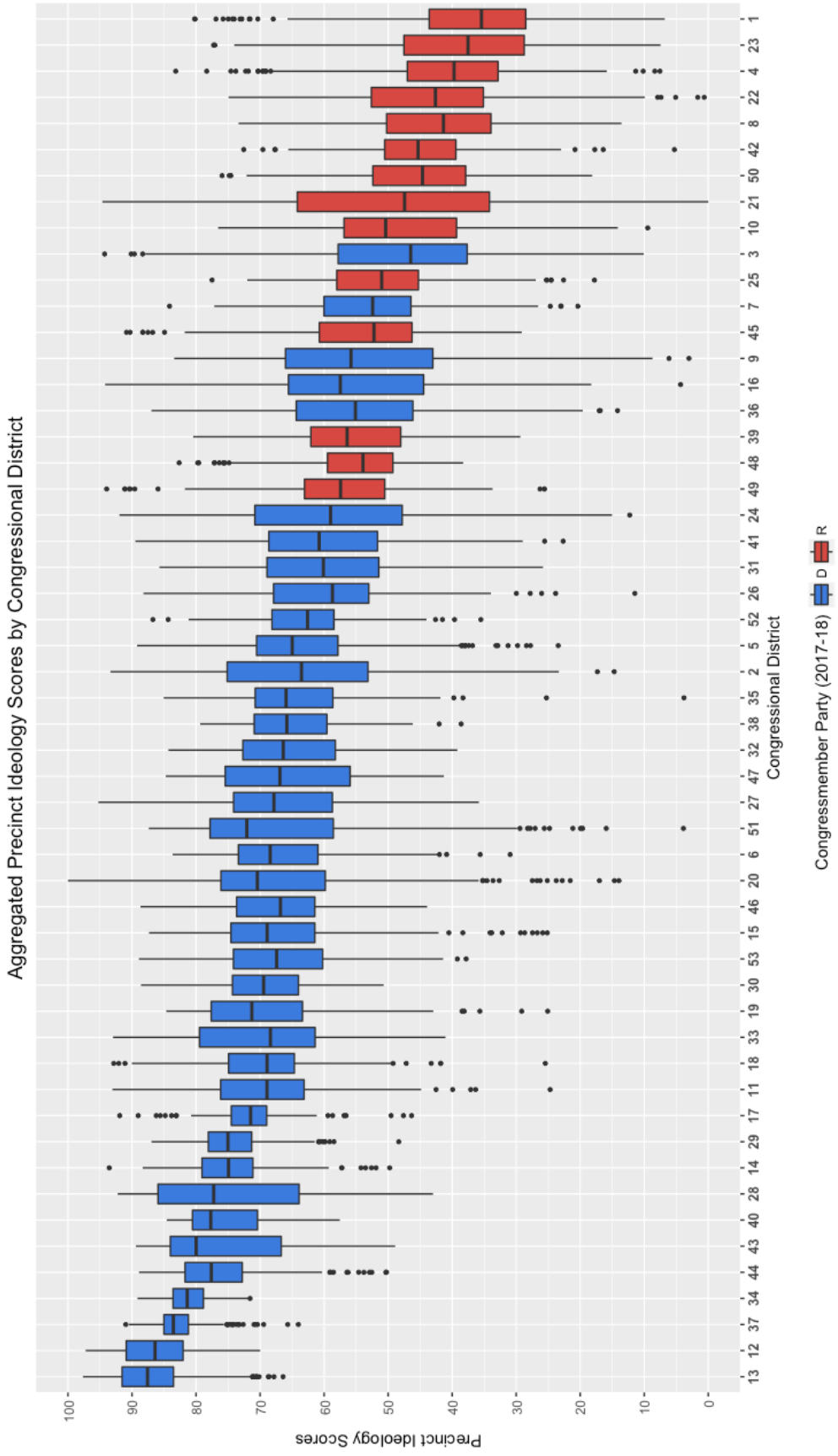
In Figure 4.3, the thin black line represents "y=x" – if county mean scores remained consistent from 2012 to 2017, the counties would lie on this line. The thicker blue line is the regression line.

in their mean score, while liberal counties (with scores over 50) largely saw an increase in their mean score in 2017. The noticeably smaller slope of the regression line compared to the y=x line highlights this change.

4.2. Congressional District Scores Line Up With Congressional Party

Figure 4.7 is a boxplot much like the one for counties in Figure 4.5, but it shows the distribution of precinct scores in each U.S. congressional district,

Figure 4.5


Aggregated Precinct Ideology Scores by Congressional District
Precinct Ideology Scores
100
90
80
70
60
50
40
30
20
10
0
Congressional District
13 12 37 34 44 43 40 28 14 29 17 11 18 33 19 30 53 15 46 20 6 51 27 47 32 38 35 2 5 52 26 31 41 24 49 48 39 36 16 9 45 7 25 3 10 21 50 42 8 22 4 23 1
Congressmember Party (2017-18)
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R

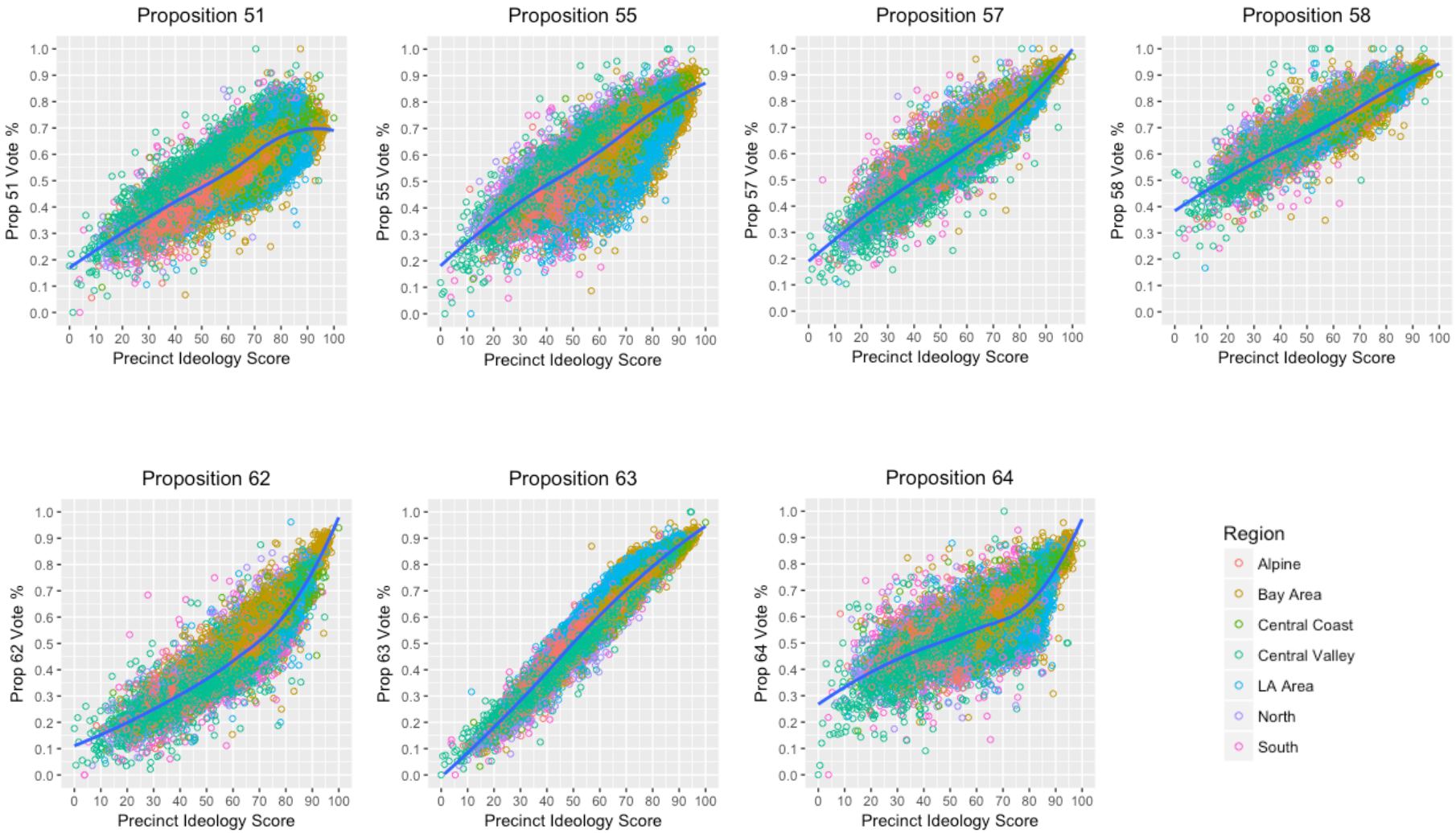
arranged from most liberal to most conservative. It is clear that the ideology index has a close association with congressmember parties in congressional districts – more liberal districts have Democratic representatives and more conservative districts have Republican representatives. Districts with a median ideology score between 47 and 57 have both Democratic and Republican districts. Districts 49, 48, and 39 – all located in Orange County – are the most liberal districts to be represented by Republicans, with mean scores well over 50. District 3, northwest of Sacramento in the northern inland part of the state, is the only conservative district held by a Democrat, with a mean score of 48. The most ideologically diverse district, based on its wide distribution of ideology scores and substantial amounts of both liberal and conservative precincts, is District 21, held by a Republican and located in the Central Valley.

4.3. Examining the Relationships Between Ideology and the Proposition Results

Figure 4.6 allows us to see the nuance in the relationships between ideology and each proposition result. It is clear that Proposition 63, with its correlation coefficient of 0.97, is the greatest predictor of ideology score, implying that opinions on gun control are highly predictive of overall ideological belief. Propositions 57 and 58 also correlate strongly with ideology, though both measures seemed to be more popular with voters across the spectrum than their precinct's ideology score would seem to indicate. For example, even the average precinct with a conservative score of 20 still supported bilingual education (Prop 58) at a rate just above 50%.

Proposition 62, which would have repealed the death penalty, was the only measure in our study that did not pass. Though opinions on the death

Figure 4.6 – Ideology Scores vs. Proposition Results



penalty are still very highly correlated with ideology, the plot shows that many typically liberal precincts voted more conservatively on the issue than their ideology score would indicate. For example, according to the LOESS curve, the average 70-score precinct was split 50-50 on the death penalty repeal.

Table 4.1 – Correlation Between Ideology Score and Proposition Results

Proposition	Description	Correlation Coefficient
51	Education bond	0.80
55	Income tax to support education	0.82
57	Relaxed sentencing for non-violent felons	0.92
58	Bilingual education in public schools	0.91
62	Death penalty repeal	0.90
63	Gun control/improved background checks	0.97
64	Legalization of recreational marijuana	0.71

Proposition 64, which legalized recreational marijuana use, has the weakest correlation of the group, with a correlation coefficient of 0.71. A weaker correlation implies that there are other factors besides conventional political ideology that play into voters' positions on marijuana legalization. Though those in favor of Proposition 64 were generally more liberal, both the "yes" and "no" campaigns received bi-partisan endorsements and, according to polling, support was highly dependent on age, regardless of political persuasion.[42] Similarly to Proposition 62, the plot for Proposition 64 shows that many liberal precincts did not support the measure to the degree expected by their ideology scores.

The financial measures, Propositions 51 and 55, were strongly correlated with ideology (correlation coefficients of 0.80 and 0.82, respectively), especially

[42] "USC Dornsife/Los Angeles Times Frequency Questionnaire, October 22-30, 2016," *Greenberg Quinlan Rosner Research*, accessed December 5, 2017. https://gqrr.app.box.com/s/67rosf94ccth3qmpedalm1wxv0uim9p7

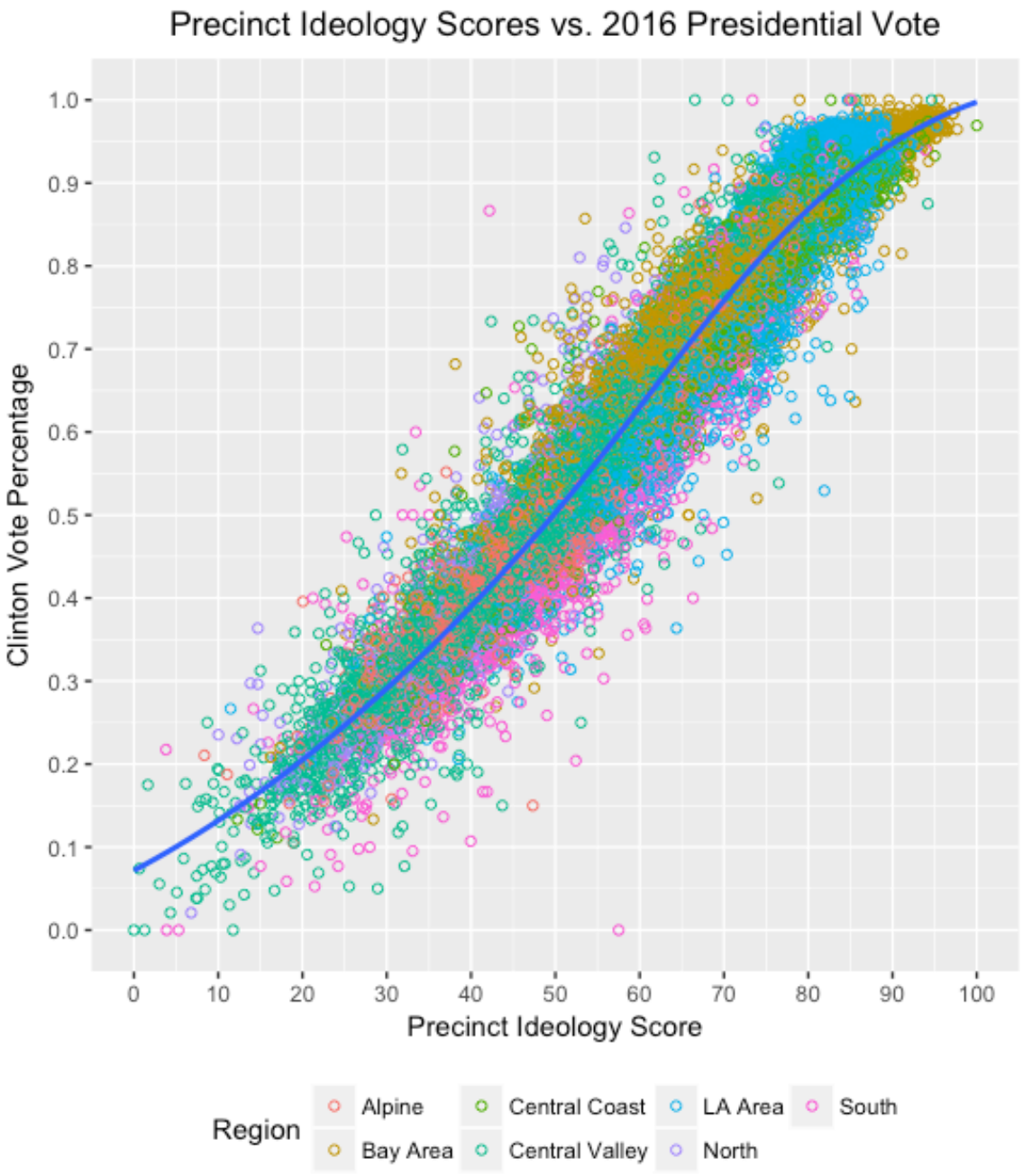
compared to Proposition 64, but their correlations were weaker than the rest of the measures. Support for Proposition 51 (the education bond) tailed off in the strongly liberal precincts. For Proposition 55, which extended the tax increase on incomes over $250,000 to primarily fund education, the LOESS curve indicates a fairly linear relationship between ideology and support for the measure. But the bulge in the fourth quadrant of the plot suggests that, again, there were many otherwise liberal precincts that did not vote for Proposition 55 as expected, especially in San Francisco, Los Angeles, and San Diego Counties.

4.4. The Predictive Relationship Between Ideology and 2016 Presidential Vote

The new ideology scores are extraordinarily predictive of the 2016 presidential vote – the correlation between the two variables is 0.96, which is greater than the correlation between the scores and every proposition that went into formulating the score, except for Proposition 63. The relationship between precinct ideology scores and presidential vote is displayed in Figure 4.7.

The relationship between ideology score and 2016 presidential vote gives us both a good measure for assessing the performance of the ideology scores, as well as a sense for how the presidential election tracked with ideology. Besides the strong correlation, we see that as ideology score increases above 55, Clinton vote percentage tends to slightly outpace ideology score. If we follow the LOESS curve, we see that a precinct with a score of 70 is expected to have given Clinton 75% of the vote, or a precinct with a score of 80 is expected to have voted for Clinton at a rate of about 87%, etc. This finding implies that in liberal precincts, Clinton was more popular (or Trump less popular) than the voters' overall ideology would seem to indicate.

Figure 4.7



It should be noted that the measure of 2016 presidential vote here is strictly the major political party vote, i.e. Figure 4.6 shows the relationship between ideology score and the percent of Clinton and Trump voters that voted for Clinton, rather than Clinton's overall vote percentage. Since the ideology index is a two-way liberal/conservative measurement of ideology, it is more useful to measure the relative performances of Democrats (representing liberals) and Republicans (representing conservatives), especially considering that the two major parties received over 93% of the total presidential vote in 2016.

5. Conclusion

The improved political ideology index suggests that California has become more liberal overall. It is likely that the simple nature of using differing propositions from the 2012 index to construct the new index contributed to the more liberal statewide mean ideology score. Forming more indexes in the future using forthcoming proposition election results will be crucial in determining whether an increased liberal mean score is indeed a function of ideological change among the California electorate, or a byproduct of the methodological choices in this research. The new index also suggests that California has become more ideologically polarized geographically. Counties that lean conservative, primarily in rural, inland areas of the state (especially in the Alpine, North, and Central Valley regions) have become more conservative, while counties that lean liberal, mostly in coastal, urban areas (such as the Bay Area, L.A. area, and Central Coast regions) have become more liberal since 2012.

The ideology index is especially predictive of 2016 presidential vote, as well as opinions on gun control. Ideology is also closely correlated with opinions on crime and punishment and bilingual education. Although ideology is still associated with opinions on bonds, income taxes for the wealthy, and marijuana legalization, the association is not as strong as with the other issues. Liberals in urban centers are less likely than other liberals to support an income tax increase, while other factors (such as age) are more associated with opinions on marijuana legalization. When precinct scores are aggregated by congressional district, as expected, liberal districts are generally represented by Democrats, while conservative districts are represented by Republicans.

The new ideology index could have been strengthened if it were developed using results from multiple elections. If proposition results from the midterm election in 2014 were used in conjunction with 2016 results, the index results would have had greater certainty and been more representative of the ideology of the various precincts, since it would have captured a cross-section of voters from the two elections. This index only uses 2016 results because precinct boundaries in California often change at the discretion of individual counties, making it difficult to have a consistent set of precincts to form the scores. In order to use results from multiple years, David Latterman, in his California Political Precinct Index from 2012,[43] broke precincts into U.S. Census blocks, assigned precinct election results to each block, and re-aggregated the block results into "base" precincts from one of the years used. This method was not possible under the constraints of this research project.

Researchers in the future should also use the Census block data for another reason: to analyze the relationship between ideology scores and other demographic information. Voter precinct boundaries are not associated with Census subdivisions, such as tracts and blocks, which makes it difficult to obtain demographic information at a precinct level. As part of Latterman's analysis, he examined the effect of concentrations of Latino voters on various proposition results from 2008-2010, finding that even though Latinos are solid Democratic voters, they had more conservative views on legalizing same-sex marriage and marijuana at the time.[44] Further research should incorporate all sorts of demographic variables, such as ethnicity, age, education, and income, to the

[43] David Latterman, "The California Political Precinct Index."
[44] Ibid.

precinct index to provide additional insight and deeper understanding of the ideological variations.

This ideology index improves our understanding of the ideological nuance within California. Researchers can use it to assess the current political landscape and as a point of comparison for future indexes, in order to gauge ideological trends across the state. The index can be valuable to campaigns and individuals as well. Campaigns can use the precinct-level scores to inform communication and outreach strategies and focus on areas receptive to their message. Individuals, can utilize it, if made accessible and user-friendly, to make educated decisions as to where to live or spend time. The methodology contained here can also be adapted to develop ideology indexes in other areas of the country or world where ballot measures are a prominent feature of their elections.

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Appendix A – Region Specifications

In order to better understand the analysis of the ideology index, counties were divided into "regions." To simplify comparison with David Latterman's 2012 index, the same regions he defined were used here. The counties in each region are listed below.

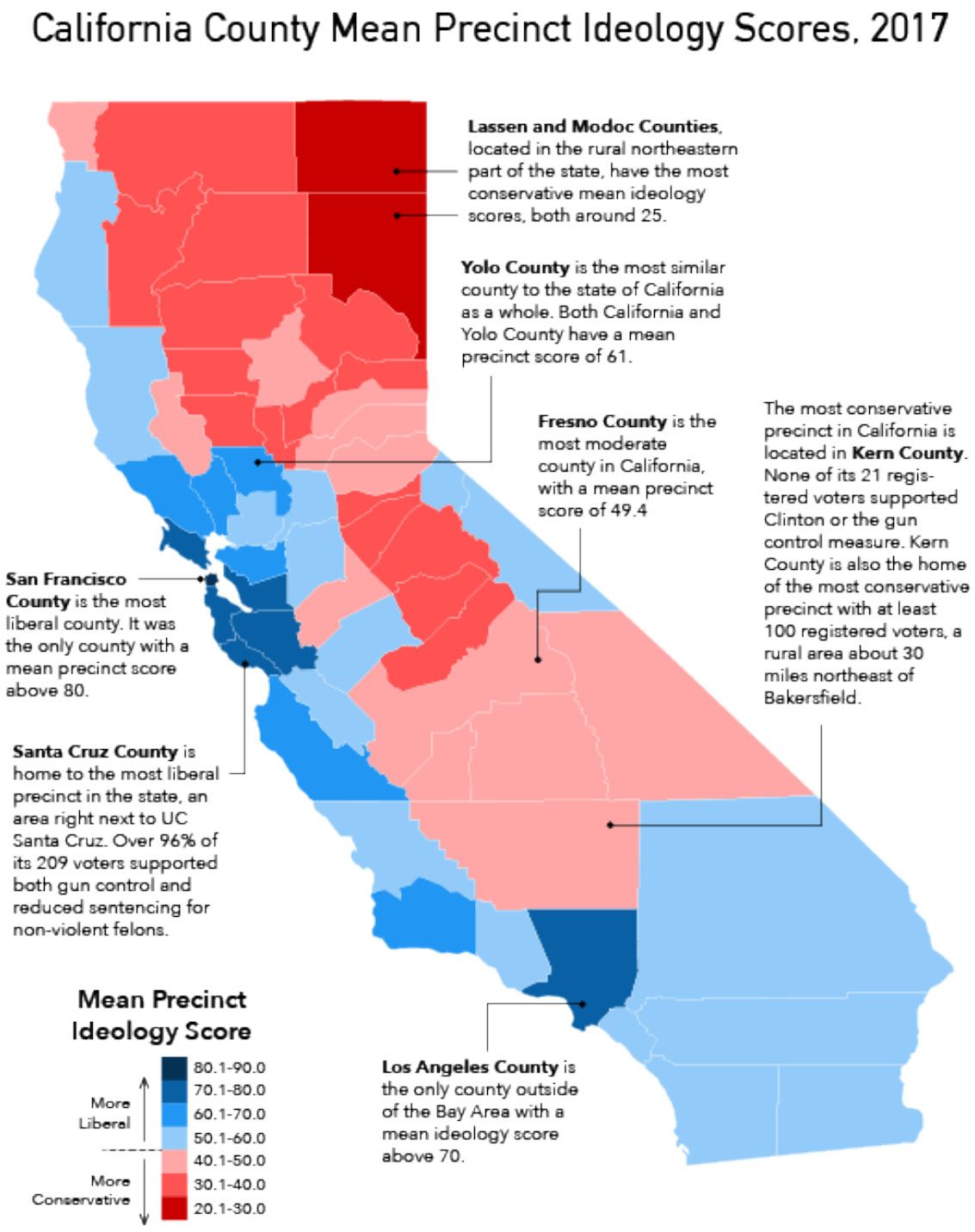
Alpine	Bay Area	Central Coast	Central Valley	LA Area	North	South
Alpine	Alameda	Monterey	Amador	Los Angeles	Del Norte	Imperial
El Dorado	Contra Costa	San Benito	Butte	Orange	Humboldt	Riverside
Inyo	Marin	San Luis Obispo	Calaveras	Ventura	Lassen	S.Bernardino
Mono	Napa	Santa Barbara	Colusa		Mendocino	San Diego
Nevada	San Francisco	Santa Cruz	Fresno		Modoc	
Placer	San Mateo		Glenn		Plumas	
Sierra	Santa Clara		Kern		Shasta	
	Solano		Kings		Siskiyou	
	Sonoma		Lake		Trinity	
			Madera			
			Mariposa			
			Merced			
			Sacramento			
			San Joaquin			
			Stanislaus			
			Sutter			
			Tehama			
			Tulare			
			Tuolumne			
			Yolo			
			Yuba			

Appendix B – County Ideology Scores Summary Table

County	N	Mean	Median	Min	Max	Range	Std. Dev.	Mean +/- from 2012	Median +/- from 2012
Alameda	949	77.51	78.88	25.15	97.67	72.53	12.66	10.19	11.24
Alpine	5	56.66	57.40	43.28	67.10	23.82	10.46	-2.66	-0.65
Amador	30	35.34	34.51	17.68	54.77	37.09	7.68	-6.44	-7.16
Butte	128	45.29	43.66	16.38	80.22	63.84	13.48	-0.86	-1.51
Calaveras	29	37.92	35.50	25.16	51.36	26.20	7.31	-6.66	-9.79
Colusa	18	38.33	36.64	17.10	69.02	51.92	13.69	2.29	0.80
Contra Costa	612	67.28	67.22	24.70	93.06	68.37	10.84	7.26	7.61
Del Norte	18	40.83	41.16	25.72	51.44	25.72	7.39	-8.40	-8.24
El Dorado	148	40.55	38.22	20.04	71.82	51.78	11.89	-2.69	-2.84
Fresno	521	49.42	50.19	5.89	94.20	88.31	16.41	0.71	2.18
Glenn	34	31.68	29.77	10.08	63.19	53.11	13.26	-2.45	-4.81
Humboldt	122	57.00	56.97	26.27	87.38	61.11	12.96	-0.34	0.55
Imperial	125	56.92	57.74	3.88	87.38	83.50	18.39	3.59	3.48
Inyo	23	45.76	45.09	26.27	64.40	38.13	11.55	-3.61	-2.97
Kern	514	43.92	40.44	0.00	94.64	94.64	17.26	1.25	-0.99
Kings	142	40.81	40.51	1.26	75.21	73.94	16.69	-3.81	-4.67
Lake	65	47.88	48.34	27.77	63.85	36.08	7.20	-7.60	-6.75
Lassen	49	25.46	24.98	6.79	61.14	54.35	9.95	-14.71	-15.31
Los Angeles	4523	70.65	72.55	17.78	95.25	77.47	11.76	8.40	9.13
Madera	91	39.97	37.16	19.75	72.06	52.31	14.24	-5.68	-7.50
Marin	173	78.83	80.07	48.05	93.37	45.32	8.01	13.11	14.08
Mariposa	25	36.98	31.91	7.54	83.18	75.64	14.93	-10.41	-12.28
Mendocino	198	58.55	58.35	27.79	88.78	60.99	11.19	-3.38	-3.41
Merced	224	51.09	53.18	4.33	89.16	84.82	14.79	2.87	3.84
Modoc	21	24.59	23.16	14.34	39.16	24.82	7.52	-8.50	-8.94
Mono	12	53.07	59.83	26.37	65.17	38.80	13.90	0.31	6.57
Monterey	180	63.94	67.98	13.96	93.21	79.26	14.63	4.65	6.77
Napa	160	62.11	63.74	29.77	83.76	53.99	9.62	5.34	6.89
Nevada	74	48.80	47.14	29.75	74.98	45.23	11.67	0.51	-0.59
Orange	1511	56.71	55.59	29.12	90.87	61.75	10.55	7.82	7.27
Placer	316	42.75	43.16	8.36	78.34	69.98	10.26	-0.54	1.14
Plumas	29	39.08	38.00	19.94	65.71	45.76	9.53	-5.69	-6.09
Riverside	756	51.82	50.99	5.30	89.48	84.18	13.33	-0.41	-0.41
Sacramento	1164	58.16	58.67	20.36	84.14	63.79	12.53	5.56	6.72
San Benito	46	52.70	52.22	17.01	76.66	59.65	13.38	0.18	-2.39
San Bernardino	918	52.94	53.25	3.80	85.73	81.93	14.22	1.56	2.62
San Diego	1808	59.82	60.76	18.12	93.96	75.84	13.50	6.63	7.83
San Francisco	589	85.37	85.25	65.62	97.24	31.62	5.83	13.52	12.86
San Joaquin	433	51.99	53.93	3.01	83.41	80.40	15.62	-1.39	-1.00
San Luis Obispo	152	53.54	52.00	15.02	79.85	64.82	12.49	-0.12	-0.12
San Mateo	424	73.27	73.65	25.45	88.33	62.89	6.78	10.55	10.71
Santa Barbara	230	62.87	65.51	12.27	91.96	79.70	16.81	6.05	9.09
Santa Clara	972	70.35	70.79	25.08	92.85	67.78	8.18	8.04	8.62
Santa Cruz	200	71.97	71.62	41.80	100.0	58.20	9.46	3.29	3.28
Shasta	117	31.15	31.04	12.22	48.50	36.28	7.57	-9.88	-9.89

Sierra	19	37.53	36.84	24.52	65.10	40.58	9.45	-4.70	-6.77
Siskiyou	58	37.51	36.72	17.21	62.20	44.98	11.77	-6.15	-7.46
Solano	198	55.84	57.08	16.23	94.28	78.06	14.56	0.64	0.95
Sonoma	352	63.83	64.75	28.40	89.22	60.82	9.87	2.76	4.21
Stanislaus	204	48.90	50.20	19.78	76.13	56.35	12.57	1.13	1.79
Sutter	51	37.81	39.69	14.39	57.22	42.83	10.93	-3.67	-0.96
Tehama	46	30.37	29.24	9.19	47.15	37.96	8.21	-8.43	-9.76
Trinity	24	36.31	37.67	14.70	51.03	36.34	9.25	-9.24	-8.64
Tulare	198	40.56	40.14	0.63	77.93	77.30	15.74	-2.01	-1.98
Tuolumne	73	36.72	37.55	16.51	53.21	36.70	8.11	-8.77	-7.46
Ventura	511	58.78	57.46	11.47	88.22	76.75	11.35	4.70	4.70
Yolo	121	61.38	60.61	24.77	90.13	65.36	16.58	5.69	5.66
Yuba	45	38.23	41.69	15.61	57.27	41.66	10.26	-7.87	-4.81
TOTAL	**20778**	**61.21**	**63.06**	**0.00**	**100.0**	**100.00**	**16.74**	**4.92**	**6.66**

Appendix C – Map of California County Mean Precinct Ideology Scores



Curriculum Vita

David Bradford
b. October 13, 1989 in Pasadena, California, U.S.
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With the completion of my capstone project presented here, I will receive a Master of Science (M.S.) in Government Analytics from Johns Hopkins University (after having previously received a Bachelor of Arts degree in Political Science from University of California, Berkeley). Through the program, I have gained knowledge in political and social science research methods, as well as statistical methods, quantitative analysis, database management, survey methodology, data visualization, machine learning, and programming in R. My research has primarily focused on elections, particularly in California. In addition to this capstone project that introduced a new measurement for political ideology at the precinct level, I completed a data visualization portfolio project examining the 2016 election in California, including voter behavior, its historical context, and its significance to the rest of the country.